COMPUTER APPLICATION IN U. S. COAST GUARD PERSONNEL MANAGEMENT

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ABSTRACT

The improvement of personnel systems through automatic data processing and operations research is a new field. This report provides an elementary introduction to several operations research techniques, reviews current usage of automatic data processing methods, outlines the research presently being pursued, and presents potential applications in Coast Guard personnel systems. These applications relate to supply, retirement, and training problems. The author recommends that the Coast Guard instigate feasibility studies of automating: (1) enlisted personnel service records; and (2) the system of assigning enlisted personnel to specific billets.

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CHAPTER I

STATEMENT OF THE PROBLEM

I. SCOPE OF THE PROBLEM

Transferring U.S. Coast Guard enlisted personnel are normally informed well in advance of their destination district. However, the specific assignment, and thus the ultimate geographical location, is seldom known. This constitutes a "stumbling block" to adequate personal planning for the individual with regard to family and household effects. The problem is neither isolated nor confined to the U. S. Coast Guard. Some enlisted men have indicated that this is a factor in their failure to reenlist.

Any orders issued to enlisted personnel for relocation within the same district are issued by the District Personnel transfer, i.e., from one specific unit to another. Consequently, the problem area outlined above does not normally exist on transfers within a district.

The inter-district transfer problem was recognized as early as 1957, both the current solution is a stopgap, consisting of a form (CG-4085) mailed by the individual to his designated district requesting his unit assignment.

Experience has shown that this system does not function adequately mainly due to three factors:

1. Lack of information contained within the form.

2. Lack of advance knowledge as to the assignment needs within the new district office.

3. Lack of enforcement concerning the return of the form (minimum being forty-five days).

The assignment request form was purposely designed to be short and to remove the possibility of any stigma of the individual's past performance effecting his new assignment. The form contains the following information:

1. The six most recently occupied billets, to indicate experience level.

2. The size and present location of the individuals family.

3. The billet(s) the individual desires within the new district.

There is no mention made of the past performance marks received or of the conduct ratings received.

The service record for the individual is not forwarded until after his departure. If this item, which is a comprehensive record of the individual from the time of his enlistment until severance from the service, were available in duplicate or reproducible form the destination personnel officer's assignment

task would be greatly facilitated, even within the present system.

II. SCOPE OF THIS STUDY

It is the purpose of this paper to investigate the possibility of utilizing automatic data processing (shortened to ADP) to transfer personnel. The key questionsin the research are:

1. What operations research quantitative models are applicable to personnel assignment?
2. What current research is being pursued in the area of personnel assignment?
3. How is automatic data processing (ADP) being utilized in the United States in the field of personnel administration?
4. What research must be pursued in the future, if any, to make the utilization of ADP in personnel assignment feasible?

III. STATEMENT OF SOURCES SEARCHED

Every issue since since 1946 of Operations Research, Naval Research Logistics Quarterly, Management Science, Operational Research Quarterly, and Psychometrika was searched for relevant material the bibliographies of Batchelor (1959), the operations research texts, and the International Abstracts in Operations Research were examined for personnel applications. All government

research and technical reports were searched through the U. S. Government Research Reports and the Defense Documentation Center, Cameron Station, Alexandria, Virginia, and their bibliographies exhausted. The bibliography contained herein lists all sources felt relevant except in the case of duplication of effort to reduce redundancy.

CHAPTER II

OPERATIONS RESEARCH TECHNIQUES

Although operations research has not developed into an exact science, and there are many definitions of just what constitutes this area of endeavor, several analytic techniques have been developed which have personnel applications. The author presents in this chapter those techniques and sources which may be utilized to obtain more thorough presentations.

This study will discuss the following techniques:

1. Statistical decision theory, the application of statistical methods to arrive at decisions under conditions of uncertainty and risk.
2. Linear programming, a matrix approach to optimal solution of a problem whose variables are linear or where an assumption of linearity will not alter the final choice of an optimal solution.
3. Queuing theory, the application of principles of sequencial alignment of input variables to optimize output variables.
4. Network flow theory, arrives at the optimal solution of a process problem by treating the process as a series of interconnecting paths along which input resources must flow, in order to minimize resources wasted and/or the input/output ratio.

5. Markov chains, this technique was developed to predict the effect of change in a system on that system using probabilistic methods.

I. STATISTICAL DECISION THEORY

Decisions are made frequently by management where some degree of uncertainty or risk is associated with the outcome. Statistical decision theory can be utilized to provide management with predictions of those outcomes, so that two basic types of error involved with a particul decision may be partially averted. The errors involved are choosing not to act when action was required and acting when no action is required. The act could be any number of situations, such as buying, building, training, or retruiting.

All predictions hinge upon the information available to the statistician and/or the decision maker. Information gathering strategy enters into the theory, since information gathering costs money. This cost is weighed versus the costs involved in making a decision without information and the situation with the most value (or least cost) is chosen.

Each outcome has a value to the decision maker which Von Neumann and Morgenstern (1947) call utility. The assignment of utility to an outcome is important throughout operations research, since this is a means of determining the gains available in a

given situation. In the case of personnel, utility could be measured in time used in a given task, expense, or any other term which would be common to the individuals and jobs under construction. However, since individuals vary from day to day, by degree of experience and training, etc., all in a non-linear fashion, it is extremely difficult to devise a system of measurement which is all inclusive and yet simple in operation.

For example, consider the problem of placing recruits in Coast Guard training schools on the basis of some test(s). Assume the training remains the same no matter what the caliber of students, and that the relationship between school performance and utility to the Coast Guard is linear. The total utility gained by testing will be a linear function of the "validities" which are the correlations of the test with performance in each of the schools. This utility may be compared with the utility of not testing or the utility of incorporating two tests, with the solution with the highest utility becoming the solution shosen.

II. LINEAR PROGRAMMING

The costs involved in moving resources from one location to another can rapidly become prohibitive unless some means of control is provided. Prior to the development of linear programming,

managers frequently solved this problem on intuitive knowledge and accepted the additional costs they incurred. This condition existed due to the fact that the manager's time was more valuable than a more accurate solution. After the inception of linear programming however, clerks and/or machines could be utilized thereby saving the manager's time, reducing costs, and enabling the industry to become more competitive due to lower price capability.

Linear programming is nothing more than a technique to solve a set of linear equations simultaneously, subject to specified linear constraints. The technique first solves for a set of values for all the variables which satisfy the constraints, which is called a feasible solution. Then all that is done is to move from one feasible solution to a better one which either reduces the costs or increases the gain or utility. The object is to minimize costs or maximize utility and know when this solution is attained. Dantzig (1950) has developed two methods for solving this set of relationships, called simplex and revised simplex, which reduce the time involved in attaining a solution to as much as one-sixth the original algebraic method. There are many varieties of applications of linear programming, but the one mentioned throughout this section is referred to as the transportation problem.

Basically, the transportation problem consists of moving resources from several locations to n points of need. The cost of shipping a given resource from one location i to a given point of need j is known for each of the m times n routes available. Linear programming solves the problem of determining how much of a given resource to ship from each origin to each point of need at the least cost. It is readily apparent that men may be the resource under consideration and that the problem of allocating trainees to schools, the problem of distributing recruits to the field, or the problem of assigning three men to three different jobs or billets might easily be solved by this technique.

If three men are assumed to have equal ability for all practical purposes, then they may be assigned according to least total transportation costs. Alternatively, if transportation costs are assumed to be negligible (they might be at a single origin), then they may be assigned according to some prediction of performance, etc.

Assuming that an adequate means of predicting performance is available, let us illustrate the transportation problem with a simple case involving three men named X, Y, and Z and three jobs numbered 10, 11, and 12. Letting the numbers in the table below represent the prediction of performance, we shall first show that

the problem can not be immediately solved by the common-sense strategies of assigning the best man to each job or each man to the job for which he is best suited.

		JOBS		
		10	11	12
MEN	X	8	5	7
	Y	7	9	6
	Z	5	2	3

Since X is the best suited for jobs 10 and 12, and since X and Z are best suited for job 10, the common-sense strategies fail. By attempting to get the maximum gain, the final solution is to assign X to 12, Y to 11, and Z to 10. Note that X is not used in the job he is best suited to fill. As a result he may feel extremely hostile toward either Z or the decision maker, but the decision maker has maximized his realizable gains.

III. QUEUING THEORY

Whenever we encounter a waiting line or queue, we think that someone should be able to reduce our waiting time. We all know examples of such situations. Queues in shops or at ticket offices, at refreshment counters, at barbers, the delay in being promoted until a position is emptied - all of these examples are

very similar to one another from the point of view of form. Queuing theory is a method of analyzing the queue and the variables involved with it. The two most important variables considered are the percentage of demands not filled and the average time for service. Other variables include line length, facility, idle time, routing changes, and parallel lines or a series of actions in a single line.

The most well known of the queuing theory approaches is the simple stream. The simple stream considers a single line with a predictable or stationary flow, few external effects or events governing the service, and stability or orderliness. The objective is to determine the probability of an event occurring during a period of time and adjusting the service to that probability. Although all waiting lines do not meet the specifications of the simple stream method, most solutions will not be adversely affected by this treatment if they are fairly cyclic and predictable. For For further exploration of this technique see Khintchine (1960), and Saaty (1959 and 1961).

IV. NETWORK FLOW

Network flow problems occur when ever a steady flow of resources is needed to obtain stable output. Examples include

hydro-electric facilities, electronic circuits, assembly line production facilities, and common utilities systems. Each of these examples utilizes a resource which flows into the system via some means of transportation (link), to a point where some task is performed (node), and then passes through the system. Control of the system is attained by improving efficiency at these nodes (which tend to create "bottlenecks") and by increasing (or decreasing) the speed of flow or the quantity entering the system.

Gorham (1960) applied this technique to the U.S. Air Force personnel system to program inputs, losses, etc., for each of four classifications of men. The results illustrated the flows for twelve time periods that would best satisfy requirements.

V. MARKOV CHAINS

This technique was developed to predict the effects changes of policy have upon a process of random occurrances. A graphic example is a bee hive in a field of clover. As time passes, the bees fly from blossom to blossom according to their whim at the moment. The state of the system is the area currently occupied by the bees, and the state transition is their movement from state to state. The probability that a given state will be occupied can be determined by the use of probability theory. These prob-

abilities and the initial distribution of the bees are utilized to predict the frequency that each state will be occupied after any mumber of transitions. The system is subject to other constraints such as the direction and velocity of wind on any given day.

A personnel system is quite similar to the above example. By substituting personnel for the bees and jobs for the blossoms, with direction of travel affected by personnel policy in lieu of the wind, the effects of various policies on the personnel system may be analyzed, with the policy yielding the desired results being chosen. It must be remembered that Markovian mathematics yield predictions only, and not values or costs. Therefore another technique must be utilized in conjunction with this theory to determine optimal policies. The Air Force has sponsered research using Markovian chain theory in the areas of retirement prediction and determining inefficiencies in personnel utilization, Harding (1964).

CHAPTER III

CURRENT RESEARCH

It has been shown that some measurement of job performance is necessary to enable the personnel administrator to evaluate and assign personnel. Currently, personnel assignment decisions are made in the absence of full information. The individual's service record is retained at his old unit until his transfer, and little information about him is forwarded prior to the point in time when he must be assigned to a specific location. These decisions are usually made solely upon the current need in the decision maker's organization based upon prior assignments and the indicated desires of the individual.

Several attempts at measuring intelligence and/or aptitude have been made, including the AFQT test and the GCT series of tests administered by the military. Generally, the uses of these tests can be broadly stated as:

1. To estimate intelligence level.
2. To determine mental, physical, and sensory aptitudes for job assignment and/or additional training.
3. To establish historical records of groups or individuals for comparitive purposes.

4. For continuing evaluation of test validity and reliability, to determine when new or modified tests are needed.

The tests are designed to be utilized as indicators, each in their own light. However, the scores of the tests are added, with a minimum cumulative score being specified by the service. See United States Coast Guard Commandant Instruction 1510.1A.

There are other limitations to these tests which illustrate the lack of refinement that remains. The minimum score specified for damage controlman, radar technician, and storekeeper is 105 (the sum of the GCT and ARI). No means of determining which rating the individual is best qualified to pursue exists, except indicated personal preference.

The results of utilizing the tests appear to be satisfactory, since the personnel who are trained normally perform their tasks adequately. However many individuals have been barred from entering a rate on the strength of the scores attained. A man who experiences a bad day or does not fully comprehend the significance of these tests, which are normally administered only once, is handicapped for the remainder of his service career.

This same problem has been recognized by several researchers including King (1964), Votaw (1959), and Ward (1959).

King states that the tests fail to adequately predict performance due to lack of refinement. He further states that the reason the scores are not valid when added is that each test measures properties on an ordinal scale, where the score of 60 is preferred over 50, but the difference between 60 and 61 or 50 and 51 is not relevant and therefore should be disregarded. The suggested method of measurement is a ratio scale, where each score is expressed as a ratio in respect to an expected norm. King has determined that the present system is useable as long as provision is made for costly reassignment, retesting, and the recognition that errors can and will happen.

Ward suggests that a "decision index" might be the solution. Assuming that the worth of an individual always exists implicitly if not explicitly, he suggests deriving a quantified value to represent the amount of an individual's productivity. Ward states that this value need not be the final answer to the question of productivity on the job, provided a means of improvement is available to the personnel planner.

After the decision index is applied, a table of values is drawn up and optimized in a linear programming computer program. Initially, the system would not be refined and subject to error. Consequently counselors would be needed to account for unforeseen significant information, and the computer output utilized solely as an assignment guide.

Abelson and Tuckey (1959) have attacked the prediction problem with predictors which are not subjective and have achieved some preliminary results. Votaw (1959) utilizes the present tests and a computer in a "hunt and find" technique which exhibited a two to five percent increase in efficiency.

A system, called PROJECT COMPASS, has been developed at the Personnel Research Activity, San Diego for recruit assignment. COMPASS utilizes the Ford-Fulkerson Method for Assignment Problem by Wolfe (1964). Trial runs indicate that COMPASS does a more effective job using the present criteria, and using more complex criteria is capable of selecting better groups for the schools than the present procedure. Regrettably the system for determining the inputs were not set forth with the program the author evaluated.

Another system which appears to offer more than those mentioned above is OSCAR: Optimum Selection, Classification, and Assignment of Recruits. This system, developed by Holdredge (1962), provides for frequent updating thus ensuring a continual refinement process. The system utilizes a queuing theory program thereby providing the capability of handling waiting lines, which are not provided for in the above systems.

The present director of Pers 19, Navy Bureau of Personnel, has stated that the Navy now possesses a program which can assign personnel to billets. However, it was not utilized beyond a test period due to agitation arising from affected personnel (those being transferred not those assigning.)

These are just some of the examples which can be sighted to illustrate that operations research technology is well advanced and being utilized throughout the United States. Since so many agencies have utilized these systems to advantage and at a savings, this field lends itself well to further investigation, and the potential justifies the cost.

CHAPTER IV

ADP APPLICATION IN PERSONNEL MANAGEMENT

Computer applications have been wide and varied in numerous areas of business and government in recent years such as accounting, inventory control, production and planning control, scientific and engineering applications, command and control, etc. Use of computers, however, in personnel management has only recently really started to advance. Before investigating government applications, it is of interest to survey other efforts in this area.

I. COMPUTER APPLICATIONS IN INDUSTRY

Dickman (1964) of the applied Physics Laboratory of John Hopkins University has been involved in the following study, Information Retrieval in the Personnel Department - A Survey of Methods used in Scientific and Engineering Organizations. The study was undertaken to determine the approach that scientific and engineering organizations are taking to automate personnel records, the nature of such automated systems, the degree of success encountered, and the efforts made toward developing a structure of technical skills.

Questionnaires on automatic retrieval of information in the personnel department were sent to 256 organizations. A total of 107 firms responded: 95 with completed questionnaires. The following conclusions were drawn:

1. The actual need for automation of personnel records was first seen as a firm approached 500 professional employees.

2. As continued growth occurred (up to 1000 employees), the need for automation was confirmed; (however, automation was actually employed as a means for simplifying clerical tasks for each area of personnel separately - automated subsystems were not integrated into one working record system).

3. After clerical problems of preparing statistical reports were solved, in the 1000-1500 employee group, firms began to load more detailed information about each employee into the system so that comprehensive lists of employees could be provided.

4. In the 1500-2000 employee group, all of the responding firms relied to some extent on automated records.

One specific company that has instituted the use of computers in personnel management is the American Machine and Foundry Company (AMF), which manufactures sporting goods, defense equipment and other industrial and consumer products, Coughlan (1965). The company has been one of the pioneers in this computer

application, centralizing its entire personnel records system by means of electronic data processing. As a result of implementing this system, AMF has gone a long way toward:

1. Achieving uniform implementation of its wage and salary policies throughout its 42 divisions and subsidiaries.
2. Streamlining its procedures for giving promotions and pay raises.
3. Bringing its insurance and retirement programs up to date.
4. Simplifying the record keeping done by most of its divisions and subsidiaries.
5. Broad statistical studies are feasible without local unit assistance.

Hopefully a future benefit will be the capability to conduct quick talent searches within its own ranks whenever key jobs open up.

The program was initiated to gain all the benefits mentioned by employing unused computer time at the company's data processing center. It was estimated that use of EDP would cost no more , per unit of information, than the firm's manual methods, and thus far, this has proven to be true. Actually, putting the programs on the computer involved considerable expense: a rough estimate - $5.00 per employee. This figure includes the cost of programming the application and getting it to run; however, it does not include the cost of the time and work put in by people in the field.

The computer application consists of a Personnel Automated Records program, known as PAR, and an associated Career Records program. Upon hiring a new employee, an acquisition form listing certain personal data about him, plus job location, classification insurance status, pay rate and range, and other pertinent information is filed. (A similar form was utilized to obtain the same information on current employees into the system.) Copies of this form are forwarded to the central personnel records office in New York.

There, the form is transcribed to magnetic tape, reprinted by the machine, and returned to the unit for verification and correction. Whenever a correction or alteration must be made, the revision is entered on a machine card, and forwarded for insertion into the record. Upon reverification, the old record print out is destroyed and the current one filed.

Employee data recorded on magnetic tape remains recorded for two years no matter what happens to them. Those who resign or are released will be transferred from the active file to a deferred file. One reason given for this precedure is that some employees are hired on a seasonal basis and will be reinstated from time to time to the active file.

All of AMF's some 18,000 employees are included in the PAR program, and soon some 4,000 will also be on a separate Career Records file. These will include all supervisory and professional personnel, all college graduates, and all who earn more than $10,000. This file will be chronological containing infomation on promotions, pay raises, extra education completed, outside activities undertaken and so forth.

The benefits of this program are numerous. For example, detailed breakdowns on job classifications can be obtained quickly. This information shows the highest paid engineer's or accountant's and their salaries for comparison with national rates. Consonance of division wage policy with company directives can be determined. The computer can be utilized in the preparation of letters for employees showing their exact insurance and pension status. AMF foreseesthat future benefits will include centralization of the company's annuity payments to retired personnel, and computer compilation of its 4500 oversea employees.

II. ARMY COMPUTER APPLICATIONS

Since 1957, the Army has been engaged in an extensive program to bring the advantages of ADP to tactical operations with the intent to provide field commander with information processing

capability for rapid reaction to immediate tactical requirements (United States Army, 1960). Application studies were accomplished in 60 different areas, establishing a basis for determining necessary operational requirements. Those groups making the application studies were directed to analyze the present manual data processing system, propose an improved manual system, and recommend an ADP system. Based upon these studies, four major areas were selected in which ADP subsystems were to be designated and tested, and have been designated as follows: (1) fire support; (2) personnel and administration; (3) intelligence; and (4) logistics.

Each subsystem's planning and development was separated one from the other. Because of the breadth of the problem, each subsystem was further divided into realistic "study categories". Personnel record keeping, replacements, casualties, and rotation were established as building-blocks upon which the total personnel ADP system could be established. The decision was made to identify the information requirements of a tactical field army in light of computer capability to manipulate data then impracticable by conventional machine methods, in lieu of accepting current doctrine as valid.

While waiting for a Report Generator to be made available, (a programming aid to facilitate the design of precedures and computer programs for extracting needed reports from the files),

an initial personnel subsystem, designated SS-2, was produced. This subsystem provides a company manning report, the production and maintenance of basic files which may be incorporated into the later system, while maintaining only those items of information about the individual needed by the field activity. This is accomplished by maintaining two basic files: the master individual personnel file, and the master locator file. The personnel file contains information concerning each position and the individual filling the position. The average record for an individual consists of approximately 500 alphanumeric characters with a maximum of 1500 characters. The file is maintained in "line number" sequence, with a line number corresponding to a position in the organization table. Each position is unique since these numbers are not repeated within the field activity. The locator file contains each individual's line number and information about the organization to which he is assigned.

Input data is paper tape with records of new assignees, personnel actions, and daily changes. Changes are prepared at the battle group, and transmitted by wire to the computer site for updating daily. This is accomplished with a normal time lag of not more than 12-14 hours. After the Report Generator is programmed, interrogation of master files for specific information will be feasible.

It is estimated that one computer will be required for each 40,000-60,000 persons, with the computer relatively immaterial. All troops in a given division should be processed on a common computer, although even this is not an absolute requirement as long as adequate intercomputer communications exists. The major problem in this subsystem will be adequate communications. Even at less than optimal communications, the subsystem will provide a personnel information service to field commanders which could not be achieved by conventional methods.

III. AIR FORCE COMPUTER APPLICATIONS

In November, 1959, the Air Reserve Record Center (ARRC) in Denver, placed in service an electronic data proccessing (EDP) system to maintain a bank of 535,000 reservists, Parnell (1960). The center promotes, assigns, retires, separates and discharges more than 9,000 reservists yearly. Each action is automatically recorded in the reservist's file. Strength and availability reports are automatically generated.

A feasibility study showed that the ARRC could: (1) maintain current reserve records; (2) reduce the over-all cost of operation; and (3) provide services which could not be furnished at present with savings alone estimated to amount to $278,500 each year after the first year of operation.

The center uses an integrated "total system" (automatic cross referencing) approach. All precedures were analyzed from data origination through final processing. For example, the study revealed the center prepares over a third of total orders affecting reservists. Using the "total system" approach, a tape is punched at the same time an order is prepared. This tape then is used as direct input for the computer or punched card system to seven processing points, eliminating danger of transcription errors. Provision is made for simultaneously extracting data from the master file at the same time as updating and processing. Outputs from each run are an updated master file.

For the 27 status reports of varied complexity and volume required of ARRC, the computer will process the entire master file monthly, and extract all required information. The system will also monitor changes in reserve strength and summarize them periodically. The master file at the end of the month is run through the computer and various information extracted to tape stations. Each output is processed through further computer programs which sort, compose parts, and extract information for further processing.

Other benefits and measures of efficiency are:

1. Documents covering updated data files for 134,609 officers and 400,993 airmen not on active duty are maintained.

2. Processing an average of four million pieces of mail per year pertaining to reservists' status in 17 minutes per 1,000 inquiries vs. 367 man-hours per 1,000.

3. ARRC has ready access to data on reserve strength, skills and availability for detailed reports to all interested parties.

4. Over 20,000 personnel record file changes may be processed daily, including audits.

5. The EDP System identifies individuals due for periodic personnel serveys used to maintain reserve mobilization potential.

The system addresses forms, control surveys, and provides follow-up mailing when needed.

The Air Force currently has a computerized personnel system for each of its major commands. They are now in the process of establishing a single total personnel system (automatic cross referencing) for the whole Air Force with an initial random access capacity of 300 million characters of information.

IV. NAVY COMPUTER APPLICATIONS

The efforts of the Navy in using computers in personnel management is the Naval Manpower Information System. This system is a Navy-wide information service designed to gather, process,

and disseminate information required for personnel management. the objectives of the system are to identify the requirements of the Navy for naval manpower and personnel information, to develop and install the most effective methods of accumulating, processing and maintaining this information, and to provide, through machine data processing methods, information as required by the Bureau of Naval Personnel, the Operating Forces, and the Navy and Shore Establishment. The system consists of the following components: The Manpower Information Division in BUPERS; and Personnel Accounting Machine Installations (PAMI).

The computer installation, augmented by a PAMI/BUPERS transceiver network and medium scale computers in Norfolk (PAMILANT), San Diego (PAMIPAC), and Bainbridge (PAMICONUS), has made significant progress toward achievement of an integrated system of data handling. The installations are currently being used in the functional areas of manpower requirements and allocations, personnel accounting, personnel distribution, and financial administration, for active duty enlisted and active/inactive duty officer personnel.

Within limits, set by OPNAV on manpower requirements and allocations, BUPERS determines the qualitative allowances, and the requirements and complements for each activity.

Requirements for each billet are projected for the end of the current fiscal year plus five additional years. This information, together with activity identification data for about 8,000 activities is maintained at BUPERS. These files are updated weekly to reflect new or disestablished activities and new or revised allocations, allowances or requirements. Approximately 25,000 changes per week are processed. Manpower Authorization and periodic summary reports utilized by BUPERS and OPNAV are produced from these files. BUPERS files further include; 960 character records for about 73,000 active duty officers (updated biweekly), 355 character records of 200,000 inactive officers (updated monthly), and the files of 6.600 officer candidates and 10,600 NROTC students (updated daily). Monthly reports obtained from these files alone include 450-500 periodic plus 40-60 special reports covering a spectrum from one time reports to strength and budget planning, officer selection, retirement planning, and officer rotation and distribution.

Although the system does not directly assign personnel to specific billets, it does make the names of those personnel awaiting transfer available for evaluation and assignment well in advance of any prior system. Inputs are obtained from unit daily diaries, reports of school completions from training activities, and rate and pro-pay authorizations from the Naval Examining Center.

Ninety percent of the workload of the Enlisted Data Section is regular cycle processing. Four-fifths of the workload at the three PAMI's consists of normal cycle processing of such types of operations as an Active Enlisted Census, an Updated Allowance and Complement File, Active Enlisted Reports, Seavey-Shorevey operation, Active Officer Census, and others.

Although files carried in mass storage at one PAMI are not duplicated at another, regular dumps of these files allow them to be regenerated at another site for emergency processing. In addition, files carried on-line in mass storage in the Fleet PAMI's are duplicated at headquarters. Responses to special inquiries can be made by headquarters during a Fleet PAMI equipment casualty.

CHAPTER V

SUMMARY CONCLUSIONS, AND RECOMMENDATIONS

It has been shown that there are many mathematical techniques which have potential personnel administration applications. Using these techniques it is possible to classify and assign personnel, evaluate the future needs of the service, and evaluate personnel policies. The first of these uses is limited however by the lack of adequate information concerning the future job performance of individuals.

Researchers have determined that, by utilizing these techniques with the information which is presently available, they can achieve a two to five percent increase in efficiency and expected productivity over manual means, Ward (1959) and Votaw (1959). The experience the Navy had with its experiment indicates that one variable, which has not been considered thus far, is a key factor in determining the utility of these techniques.

That variable is the lossses of productivity due to personnel reaction to being manipulated by a computer. If personnel reaction were great enough and endured long enough, then it could conceivably cancel the gains of utilizing ADP and these techniques. Since so many agencies have utilized these techniques to advantage and savings, this field lends itself well

to further investigation, and the potential justifies the cost.

Even if the utilzation of ADP to transfer or assign personnel were to be proven impractical, this would not preclude its utilzation in personnel management. This is verified by the amount that industry and the other military services have progressed in automating personnel records. The centralization of enlisted service records appears to be advantageous and this facit of administration deserves further investigation. The availability of this information alone would enhance the personnel utilization problem, since the record could be made available to the decision maker with the original orders.

It is therefore recommended that the United States Coast Guard instigate feasibility studies of automating: (1) enlisted personnel service records; and (2) the system of assigning enlisted personnel to specific billets.

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